Space Weather Technical Forecast

Issued on Sunday, 14 November 2021 at 00:28 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: Chance of G1/Minor Storm on Day 4 (17 Nov).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar Activity was Low, with one C-class flare in the last 24 hours from AR2894. There are two active sunspot regions on the Earth-facing Sun. AR2894 in the southwest has faded somewhat in recent hours, and is now classified Hax/Alpha. AR2895 in the northwest continues to be a weak spot, classified Axx/alpha. No Earth-directed CMEs were observed.

Solar Wind / Geomagnetic Activity: The solar wind speed, as measured at L1 by DSCOVR, was at ambient levels varying between 310-370 km/s. Density was average or below average, with a slight increasing trend. The IMF, Bt, was weak at 5 nT or below, with the north-south component, Bz, varying weakly between +/-3 nT. The phi angle was predominantly negative (towards the Sun). Geomagnetic activity remained Quiet (Kp 0-1).

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) as measured by GOES-16, remained at Background levels. The high energy electron flux (greater than 2 MeV) was mainly Moderate, peaking briefly at High levels between 13/2020-2105 UTC. The associated 24-hour integrated fluence remained below the Active threshold (1e8 integrated pfu) on a slowly rising trend, with 5.64e7 integrated pfu recorded at 14/0000 UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to be Very Low to Low, with a slight chance of C-class flares, primarily from AR2894 in the southwest quadrant.

Solar Wind / Geomagnetic Activity: There are no Earth-directed CMEs. Ambient solar wind speeds are expected through the next 3 days, with an increase to elevated levels likely on Day 4 (17 Nov) due to CH19/-. Geomagnetic activity is expected to be mostly Quiet, perhaps Unsettled at times, increasing to Unsettled to Active with a chance of G1/Minor Storm with the arrival of the high speed stream from CH19/- on Day 4.

Energetic Particles / Solar Radiation: The high energy (greater than 10 MeV) proton flux is expected to be background. The high energy electron flux (greater than 2 MeV) is expected to slowly decline from the current Moderate to High levels. The corresponding 24-hour electron fluence is likely to remain below the Active level (1e8 integrated pfu), with any increase due to CH19/- expected after Day 4.

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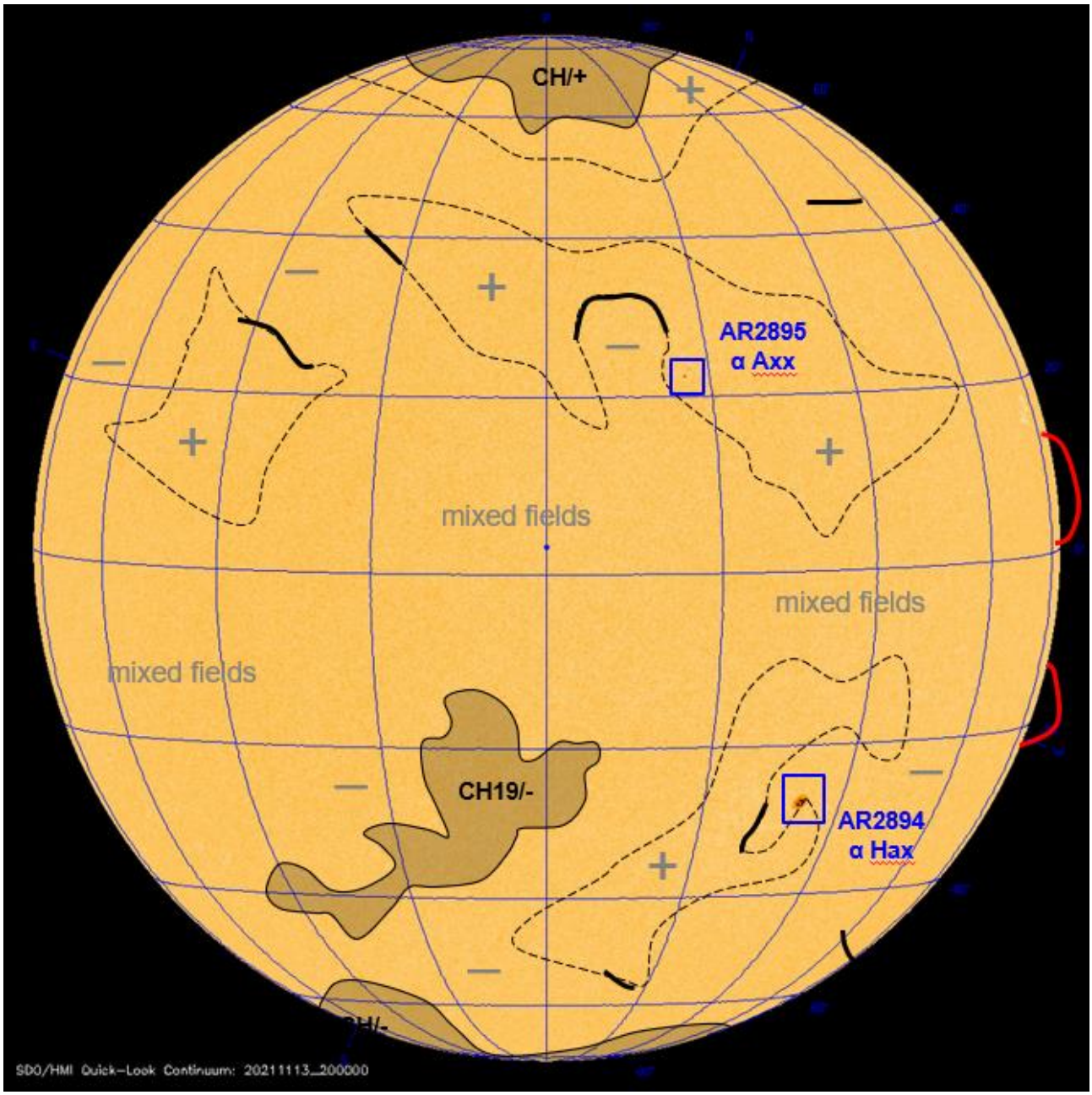
Figure 1. Solar Analysis Valid 13/2000 UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

No Earth-directed CMEs have been observed.
Solar wind speeds are currently at ambient levels and likely to stay that way through most of the next 3 days. The fast wind of coronal hole 19 is the next feature of interest. This feature was present on the previous rotation, but perhaps slightly smaller than last time around. It is most likely to arrive on Day 4 (17 Nov), but with a slight chance of an arrival late on Day 3 (16 Nov). Wind speeds are likely to be around 500-550 km/s.

Geomagnetic activity is expected to be mostly Quiet, perhaps Unsettled at times, increasing to Unsettled to Active with a chance of G1/Minor Storm with the arrival of the high speed stream from CH19/-.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	1	5	30
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

Date/time 21.5R (UTC)	Halo: Full or Partial	Source	Source Location	Estimated Speed	Estimated Arrival Time	Comments
*	*	*	*	*	*	*

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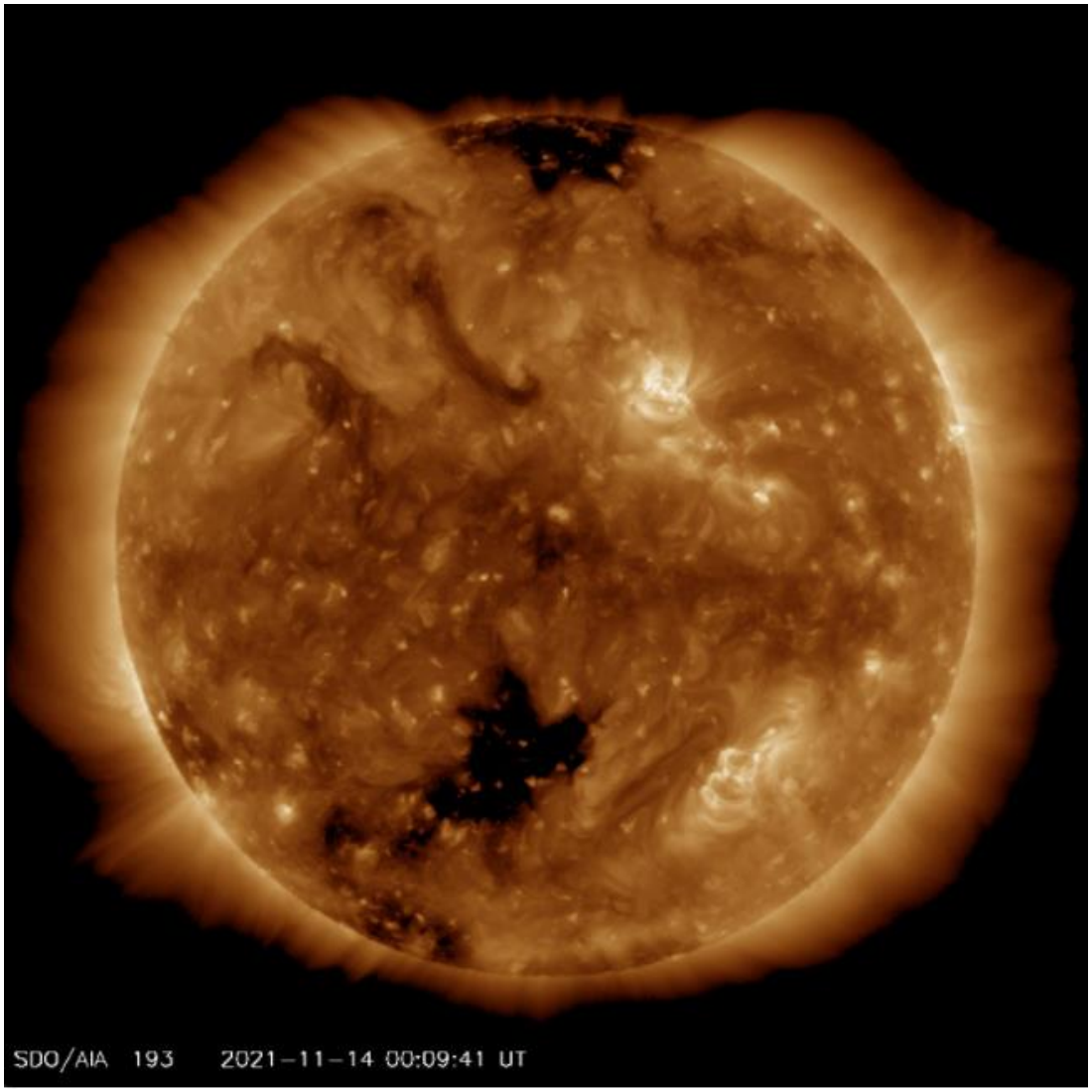
Figure 2: CH19/- near centre disc in the southern hemisphere, shown in AIA-193 imagery.



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Radio Blackouts - X-Ray Flares:

Solar Activity is currently Low, with only two small and simple sunspot containing active regions. AR2894 in the southwest, which was responsible for a C-class flare earlier on 13 Nov, has simplified since the flare with its trailing spot fading. It has therefore been re-classified as Hax/Alpha. AR2895 in the northwest remains a very small and simple Axx/Alpha spot.
Solar activity is anticipated to remain Very Low to Low, with a slight chance of further C-flares, mainly from AR2894.

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	1	1	1	1
Very Active	R3 to R5 X Class	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

The high energy proton flux (greater than 10 MeV) as measured by GOES-16, remained at Background during the previous 24 hours, and is currently forecast to remain at this level through the period.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	1	1	1	1
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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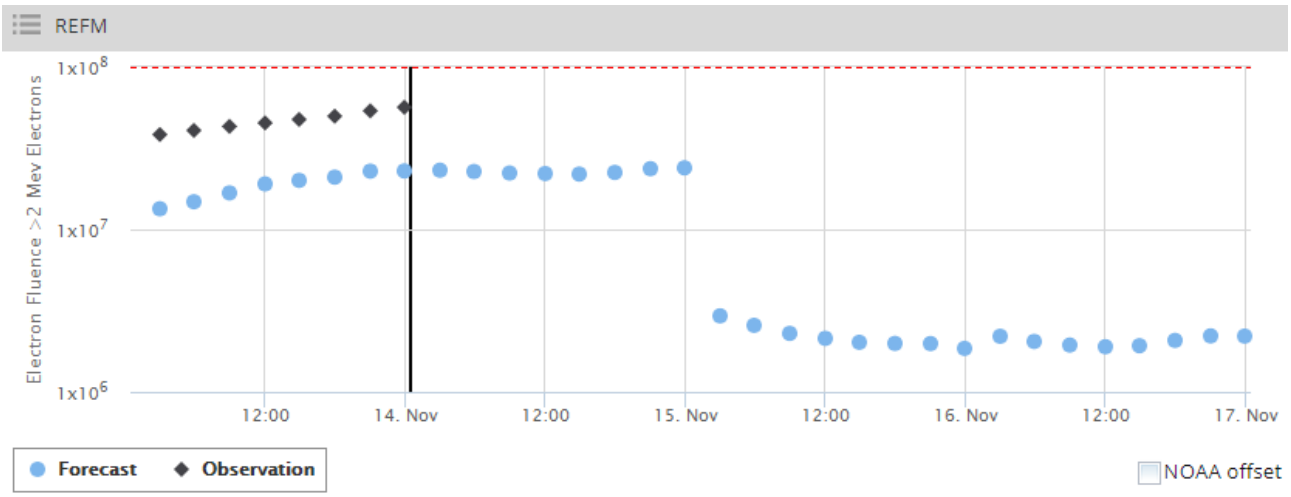
High Energy Electrons Event (≥ 2MeV):

The high energy electron flux (greater than 2 MeV) as measured by GOES-16 at GEO is currently at moderate levels, having peaked briefly at high levels (above 1000 pfu) during the UTC evening. As the wind speed is now at ambient levels, there is unlikely to be further charging and flux levels should slowly decline. On Day 4 (17 Nov) the arrival of the high speed stream from CH19/- is expected, which may lead to some charging of the radiation belts, although any electron response is most likely to occur after the end of this 4 day period.

The associated 24-hour electron fluence is likely to remain below the Active (1e8 integrated pfu) threshold, with a gradual declining trend. REFM is currently giving good guidance. Any increase in the fluence levels due to CH19/- is expected after Day 4.

GEO Electron Environment Probability (Exceedance)	Level ($cm^{-2}\ sr^{-1}\ day^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	5	5	1	5
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

Figure 3: REFM model showing a declining trend for the next 3 days, this perhaps a little too fast in the model.



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